Efficient Eye Blink Detection Method for Disabled
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Abstract:
Healthcare is the fastest growing sectors in both developed and emerging economies. E-healthcare is contributing to the major growth of this industry by utilizing the internet and all its capabilities to support its stakeholders with information search and communication process. We present a real time method based on video and image processing algorithms for eye blink detection. The motivation is to help disabled people who cannot control any kind of communication. Paralyzed stroke patients are unable to communicate with their environment so a classifier can be used in the application which counts the eye blinks. The method is used with or without smoothing filter to show the detection accuracy. This helps disabled patients to communicate effectively.

Keywords: Eye Tracking, Haar Cascade, eye blinks.

I. INTRODUCTION:
There are many methods introduced for the severely paralyzed patients to communicate with the outside world. The motivation of this research is to help the needs of disabled people who cannot communicate with the environment. And there exists the idea to develop an eye-motion detection system for the paralysis patients. The patients suffering from tetraplegia have difficulties in speech. It is difficult for the patients to make the caretaker understand what we need especially when they are in hospitals. It becomes difficult for the patients to express their feelings and even they cannot take part in conversations. This system incorporates different visual technologies, such as eye blink detection, eye center localization and conversion of the eye blink to speech. The patients lose the ability to speak and write, they can only contact the outside world through human-computer interaction; e.g. Tracking eye movements. There exists software like gesture-based communication system and voice based assistive system which enables the patients to communicate with the environment. With the goal of helping disabled patients on the bed to call for other people with a simple and easy approach, this is to develop a real time video processing system, where the eye blinks can be successfully detected.

II. PROPOSED SYSTEM:
Machine learning is applied for face and eye detection for getting eye and facial axis information. Dlib a C++ toolkit containing machine learning algorithm and facial landmarks detector is used. OpenCV aiming at real time computer vision and to accelerate machine perception to examine the state of eyelid, whether it's opened or closed. This system can track the blinking of the eyes efficiently and accurately from the video. Finally, an eye blinking detection based on eyelids state is used for controlling.

Design:
This section is also divided into 3 parts. The first part is the OS. The second part explains the python coding environments. The third parts tell about the Open CV library which is an open source library

III. LITERATURE REVIEW:
1] Atish Uday Shankar, Amit R Kaushik—Assistance for the Paralyzed using Eye Blink Detection! IEEE Paper Fourth International Conference on Digital Home, 2012 In this paper, the device that uses the signals from patient and then convert it into some form of data that is for communication. But this system is very expensive, so they have developed extremely low-priced device that read and convert eye blinking of a patient to universally accepted code that is mores code. It is helpful for the paralyzed people.

2] Assis.Prof. Are A. Mohammed, Suleiman, Shereen - Efficient Eye Blink Detection Method for disabled people domain! International Journal of computer science and Application, Vol.5, No.5, 2014 In this paper, they have designed a real-time interactive system that can help paralyzed to control the appliances like fan, lights etc. through the pre-recorded sample of eye blinking. Detection of eye blinking by using video camera with region of interest.

3] Young-Joo Han, Woosung Kim and Joon - Sang Park - Efficient Eye Blink Detection on Smartphone's: A Hybrid Approach Based on Deep Learning, 21 May 2018. In this method, they have proposed a hybrid approach combining two machine learning techniques, the linear SVM classifier with HOG features such that eye blink detection can be performed efficiently.

4] Mu-Chun Su, National Central University, Department of Computer Science & Information Engineering — An Implementation of an Eye-blink-based Communication Aid for People with Severe Disabilities, August 2008 The method presents an implementation of a low-cost vision based computer interface which allows people with disabilities to use eye blinks to access computers and communicate with other people. This communication aid requires only one low-cost web camera and a personal computer. So many experiments were conducted to test the performance of the proposed eye-blink-based communication aid.

Applied Science, Volume VIII, May 2019 In this paper they present a unique assistive system for tetraplegic patient which works on eye waver technology. Tetraplegia is also called as quadriplegia is a paralysis condition where a patient cannot move their parts below neck. In such cases the patient may even become dumb. The patient will be bedridden and must be taken care. The proposed assistive system is to enable communication between tetraplegic patient and caretaker or other people. The system works based on eye movement of patient.

6] Tambe Sameen Mohammed, Rajeshwari P—Review on Smart Eye Blink Solution for and Patient Using Python, March 2019 [Volume 4, Issue 3 The growth of technology in medicine field diminish the difficulties of patients to a large extent. The disease named Motor Neuron Disease (MND), one of the major physical disability leading to paralysis. MND patient is unable to do work like talk, walk, express their feelings and communicate due to the weakening of muscles. The patient has control only on his eye blinks, the problems facing by MND patient is obtaining a solution day by day. The broad review on literature of different solution of MND patients is described in this paper.


10] appearance for eye tracking and eye-blink detection and measurement Ioana Bacicvarov; Mircea Ionita; Peter Corcoran IEEE transaction on consumer electronics (Volume: 54, Issue:3 , August 2008 ) A statistical active appearance model (AAM) is developed to track and detect eye blinking. The model has been designed to be robust to variations of head pose or gaze. We analyze and determine the model parameters which encode the variations caused by blinking. This global model is further extended using a series of sub-models to enable independent modeling and tracking of the two eye regions. Several methods to enable measurement and detection of eye-blink are proposed and evaluated. The results of various tests on different image databases are presented to validate each model.


IV. IMPLEMENTATION:

The first step of the proposed application is the initialization. After taking a short video of the participant face using front camera. A process framing method will be used to create the frames from the captured video. Later on the coloured frames will be converted to gray scale frames by extracting only the luminance component. Using haar cascade which is a trained classifier used to detect object. OpenCV is a learning-based method, packed with the detector as well as a trainer. Using this the face and eye can be detected. In order to gather the face and eye region in the live video stream, shape predictor is used. A library Dlib is capable of giving you 68 points (landmarks) of the face. The landmark facial detector is used with pre-trained models, the dlib is used to estimate the location of 68 coordinates (x, y) that map the facial points on a person’s face. After getting index values of right and left Eye Aspect Ratio is calculated. As it shows the blink detection which is measured by calculating the eye aspect ratio (Euclidean distance between the eyes are calculated), the arguments are passed to the predefined dataset and facial landmark detection is carried out. For each and every video sequence the eye landmarks are located. The aspect ratio between height and width of the eye is calibrated. The Eye Aspect Ratio is most stable when an eye is opened and is getting close to zero while the eye is not in open state. If the person viewing the camera continuously, the Eye Aspect Ratio (EAR) is found to be normal and it reaches low value when he/she closes the eye.

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\text{EAR} = \frac{|p2-p6|+|p3-p5|}{2|p1-p4|}
\]

In order to detect blinks we are setting threshold value, and we can check to see if the eye aspect ratio is below our blink threshold - if it is, we increment the number of consecutive frames that indicate a blink that takes place. From the above methods the number of blinks are counted and are initialized to some applications through voice messages.

![](image)

Figure 1. Eye blink detection algorithm
V. RESULTS:
The Patient Eyeblink can be measured using Eye Aspect Ratio (EAR). The ratio of the eye varies for each and every person. Eye closing rate is measured after every 0.5 seconds and if the value crosses already existed threshold value, then the raspberry pi 3 counts the number of blinks and sends the alert message from speaker. The alert signal is generated from embedded device. The OS along with camera is used to detect the eye blink of the patient in real time. The detected blinks are then converted into voice messages like need of medicine, need of water, make an phone call, this helps the paralyzed people to communicate with the world.

VI. CONCLUSION:
Eyeblink detection is designed mainly to help the disabled patients. The alert signal is generated from embedded device to fulfil needs of a patient like drinking water, make a phone call. The OS along with camera is used to calculate the Eyeblink of the patient in real time. Blink is measured by detecting face and eye using a classifier called Haar Cascade Classifier, especially facial landmarks is detected using shape-predictor and Eye Aspect Ratio (EAR) by calculating the Euclidean distance between the Eyes. Accurate eye detection and faces in every frame will help to calculate number of blinks. When he/she reaches maximum threshold the patient blink is detected will be alarmed by a loud warning and the voice message is sent. In future, the implementation can be carried out in a bright room with consistent light, for different lighting conditions.

VII. REFERENCE:
[1]. Efficient Eye-Blinking Detection on Smartphone’s: A Hybrid Approach Based on Deep Learning .Correspondence should be addressed to Woo Seong Kim; wooseong@gachon.ac.kr and Joon-Sang Park; jsp@hongik.ac.kr . Received on 15 December 2017, Accepted 26 March 2018 and Published 21 May 2018


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